

Nuclear Thermal Rocket and Arc Jet Integrated System Modeling

Completed Technology Project (2015 - 2016)



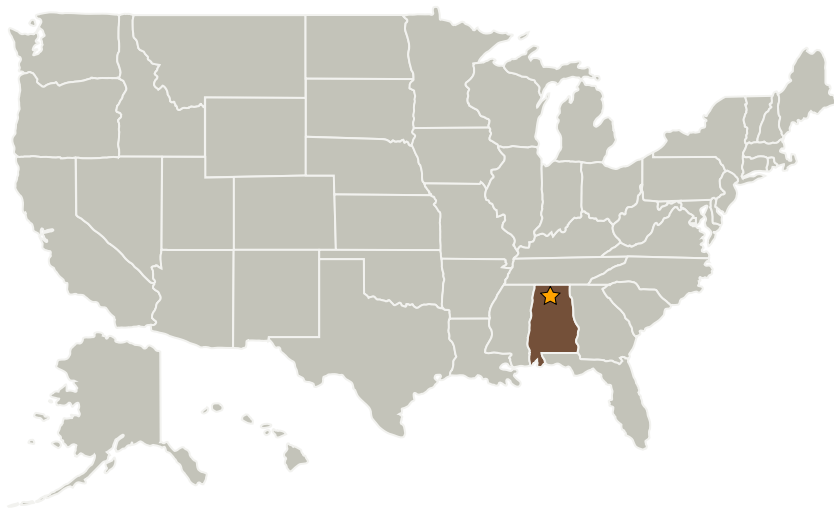
Project Introduction

To further improve achievable Isp for NTR systems, a method is proposed to augment propellant heating with an arcjet or magnetohydrodynamic (MHD) system. In this rocket cycle, the propellant gains energy in the reactor as usual, however, instead of being exhausted through a nozzle, the propellant is (1) introduced directly into a large turbopump assembly, (2) directed back through the reactor core, and (3) finally directed into the arcjet or MHD thruster. This hybrid system approach can provide very high propellant temperatures and higher Isp. A detailed system analysis will be accomplished to determine the benefits and performance of a hybrid NTR/Arc Jet system. The outcomes will be (1) a system model adaptable for specific mission analysis and (2) detailed analysis for developing such a hybrid system.

Anticipated Benefits

Investigate an innovative hybrid system for improved performance of a nuclear thermal propulsion vehicle. Seek to improve feasibility of manned Mars missions and other deep space missions by reducing transit time and crew radiation exposure.

Primary U.S. Work Locations and Key Partners



Nuclear Thermal Rocket and Arc Jet Integrated System Modeling

Table of Contents

Project Introduction	1
Anticipated Benefits	1
Primary U.S. Work Locations and Key Partners	1
Project Website:	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3

Nuclear Thermal Rocket and Arc Jet Integrated System Modeling



Completed Technology Project (2015 - 2016)

Organizations Performing Work	Role	Type	Location
★ Marshall Space Flight Center (MSFC)	Lead Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations

Alabama

Project Website:

<https://www.nasa.gov/directorates/spacetech/home/index.html>

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Center Innovation Fund: MSFC CIF

Project Management

Program Director:

Michael R Lapointe

Program Manager:

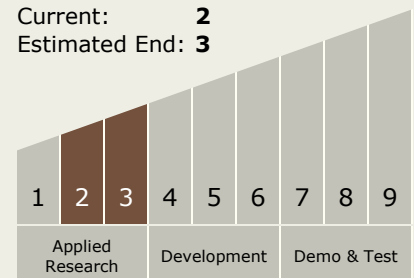
John W Dankanich

Principal Investigator:

Bryan Taylor

Technology Maturity (TRL)

Start: 2
 Current: 2
 Estimated End: 3



Nuclear Thermal Rocket and Arc Jet Integrated System Modeling

Completed Technology Project (2015 - 2016)



Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.1 Chemical Space Propulsion
 - └ TX01.1.5 Hybrids